CARE AND USE OF ROPE ON THE FARM

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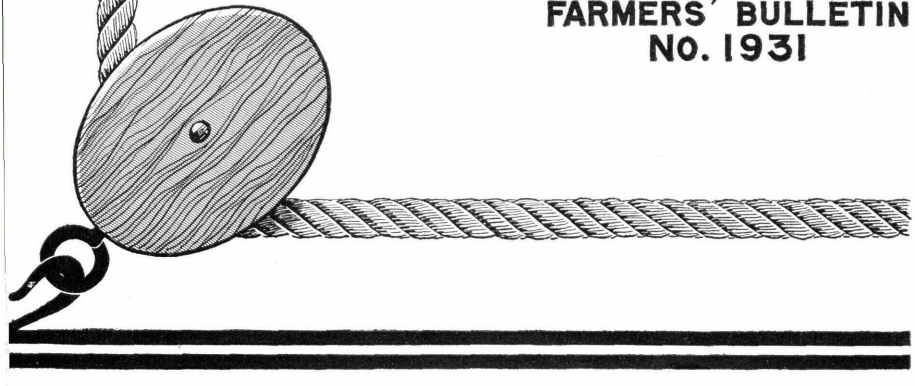

Rope Is Scarce—Make It Last

GOOD SOUND ROPE is at a premium as new manila fiber is unobtainable and suitable substitutes are hard to get. Care in storing and handling will lengthen the life of any rope.

Rope should never be stored on the floor or in a closed container where air cannot circulate freely. When not being used, it is best stored on a raised slatted platform or hung in loose coils on wooden pegs. It should be kept out of the sun, away from boilers or other sources of heat, out of damp places, and safe from rats. When wet it should be hung in the shade to dry and not permitted to freeze.

Some other practical rules for the care of rope are the following: During rainy weather loosen ropes between fixed objects outdoors. Protect rope from acids, chemicals, and strong fumes. Do not drag rope over rough surfaces, nor through sand or cinders. Avoid pulling out kinks; unwind properly. Do not overload rope or pull it over sharp corners. Use the proper size of pulleys and eyes. Rope should be inspected often for deterioration of fibers. Remember that the substitutes are not so strong as manila rope and larger sizes may be needed to do the work.

Most of the directions given for care of hard-fiber rope for general purposes apply also to rope of this type used in the household.

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CARE AND USE OF ROPE ON THE FARM

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INTRODUCTION

MOST of the rope manufactured in the United States has been made from manila hemp imported from the Philippines and from sisal fiber brought in from the Dutch East Indies and Africa. Manila hemp makes the best and strongest rope. Sisal fiber is only about 75 percent as strong as manila fiber and is harsher and less pliable. The war has cut off the supply of manila hemp and has interfered with the shipment of sisal. The supply of the lesser cordage materials, such as hemp and jute, has also been curtailed. Henequen fiber from Mexico and Cuba is used for binder twine. Cotton is used in cords for packaging, clothesline, sash cords, etc., but is not satisfactory for general farm use. In view of the scarcity of manila hemp and sisal fiber, every possible effort should be made to conserve rope.

The manufacturers of common rope twist parallel fibers together in a right-hand direction in making yarn, the yarns are twisted together in a left-hand direction to form strands, and, finally, the strands are twisted together in a right-hand direction to make the rope. This keeps the rope from untwisting and tends to equalize tension throughout the rope.

PLACING NEW ROPE IN SERVICE

New rope will handle better if uncoiled from the center of the coil in a counterclockwise direction. If it starts to unwind in a clockwise direction, the coil should be turned over and the end of the rope pulled up through the center. Uncoiling rope in the wrong direction makes it twist and kink, a source of much trouble if it is very long. Kinks in large ropes are hard to straighten out and they impair strength.

A short new rope can be suspended by one end with a light weight on the other end to equalize the strain in the various members. A long rope can be dragged across a comparatively smooth pasture or meadow to produce the same effect. Ropes dragged over a cultivated field or dirt road will pick up grit, which will injure the fibers.

Mechanical damage to rope can be caused by surface or internal wear, heat, or extreme tension. Surface wear occurs when ropes rub against each other or when they are dragged over sharp edges or rough surfaces. Too much tension on a rope, especially when it has been knotted or bent sharply over a thin support, will cause both surface and internal wear. For this reason ropes used to draw or lift heavy loads should be large enough so that the strain on them will not exceed the limits shown in table 1. If the proper size of rope is not available, as many lines of a smaller size as necessary to give the desired strength should be used. Similar wearing effects are produced when ropes are passed over pulleys that are too small in diameter or have too small a groove. Dirt or grit on a rope will work into the fibers and increase internal wear.

TABLE 1.—*The safe working strength* [1] *of various diameters of new manila and sisal rope, approximate weight, and the corresponding sizes of block*

Diameter of rope (inches)	Safe working stress [2]		Approximate length per pound	Size of block [3]	Diameter of rope (inches)	Safe working stress [2]		Approximate length per pound	Size of block [3]
	Manila	Sisal				Manila	Sisal		
	Pounds	*Pounds*	*Feet*	*Inches*		*Pounds*	*Pounds*	*Feet*	*Inches*
¼	100	70	51.0	2	⅞	1,400	980	4.5	7
⅜	200	140	24.5	3	1	1,640	1,148	3.7	9
½	400	280	13.6	4	1¼	2,500	1,750	2.4	12
⅝	800	560	7.5	5	1½	3,500	2,450	1.7	15
¾	980	686	6.2	6					

[1] Based on a safety factor of 6 and 7 for small ropes and 5 for medium- and large-size ropes—that is, the breaking strength is 5, 6, or 7 times the safe working strength.

[2] Manufacturers give the strength of sisal fiber as from 25 to 33 percent less than that of manila fiber; the figures given here are 30 percent less.

[3] The size of block is designated as the length of the shell enclosing or supporting the pulleys.

Dry rot is generally caused by improper storage conditions or by storing coils of wet rope. It is always best to stretch ropes out to dry in the shade. Where that is not practical, the rope can be hung in large loose loops, well separated, over pegs in a dry, well-ventilated storage.

Rope fibers are destroyed quickly by chemicals contained in disinfectants, fertilizers, and manures, especially when wet. Tarred ropes are desirable in wet places.

REPAIR OF ROPE

Many rope splices, knots, and hitches have been devised. Some of the types particularly suitable for farm use are illustrated here. A broken strand of rope can be repaired by laying in a new strand, thus often saving a long rope. The sharper the bend in a rope under tension, the more damage to the fibers. Therefore, wherever possible, splices should be used instead of knots, since good splices have from 80 to 90 percent of the full strength of the rope and knots have only from 50 to 60 percent of its strength.

Failure to take proper care of the ends of a rope permits ravelling, and the weakened ends must be cut off.

WHIPPING

The ends of a rope and the ends of each strand when they are separated, should be whipped with cord or finished with a crown splice to prevent ravelling and loss of turn in the parts. To whip a rope, hold a looped cord along it and wrap the long end of the cord around the rope in the same direction that it is twisted, binding the loop to the cord and keeping the turns of the cord smooth, tight, and close together, as shown in figure 1. The end of the cord is then passed

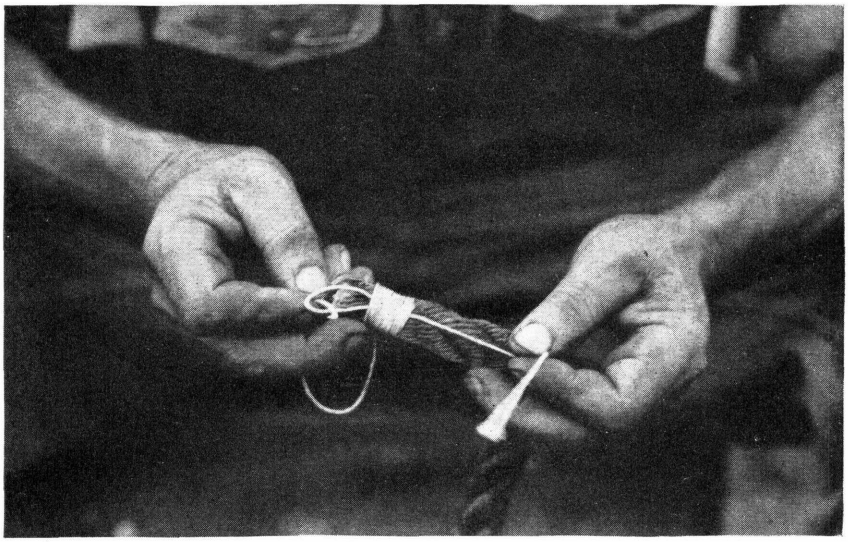

FIGURE 1.—Whipping the end of a rope.

through the loop (in left hand), pulled tight, and drawn under the whipping by pulling on end (in right hand). Both ends of the cord are then cut off close to the rope.

THE LONG SPLICE

The long splice is used to join ropes that are to run over pulleys. To make a long splice, the strands of each end are unlayed about 15 turns (fig. 2,*A*) and tied to prevent unraveling. The ends are then brought together, as shown in figure 2,*B*, making sure that each strand from the right-hand rope passes between two of the strands of the left-hand rope. Now start unlaying one of the strands (*c*, figure 2,*C*) from the right end until about five turns of that strand are unlayed, replacing it with the corresponding strand from the left end. This strand should be kept tightly twisted to correspond with the unmoved strands. Repeat this process by unlaying a strand (*b*) from the left end. Two strands end at *b*, the second two at *c*, and the remaining pair at *a*. All strands are cut to the same length, and the splice is completed by tucking the ends of each pair of strands as follows: The strand from the right is passed over the strand from the left and under the next strand, as shown in figure 2,*C*. Always keep

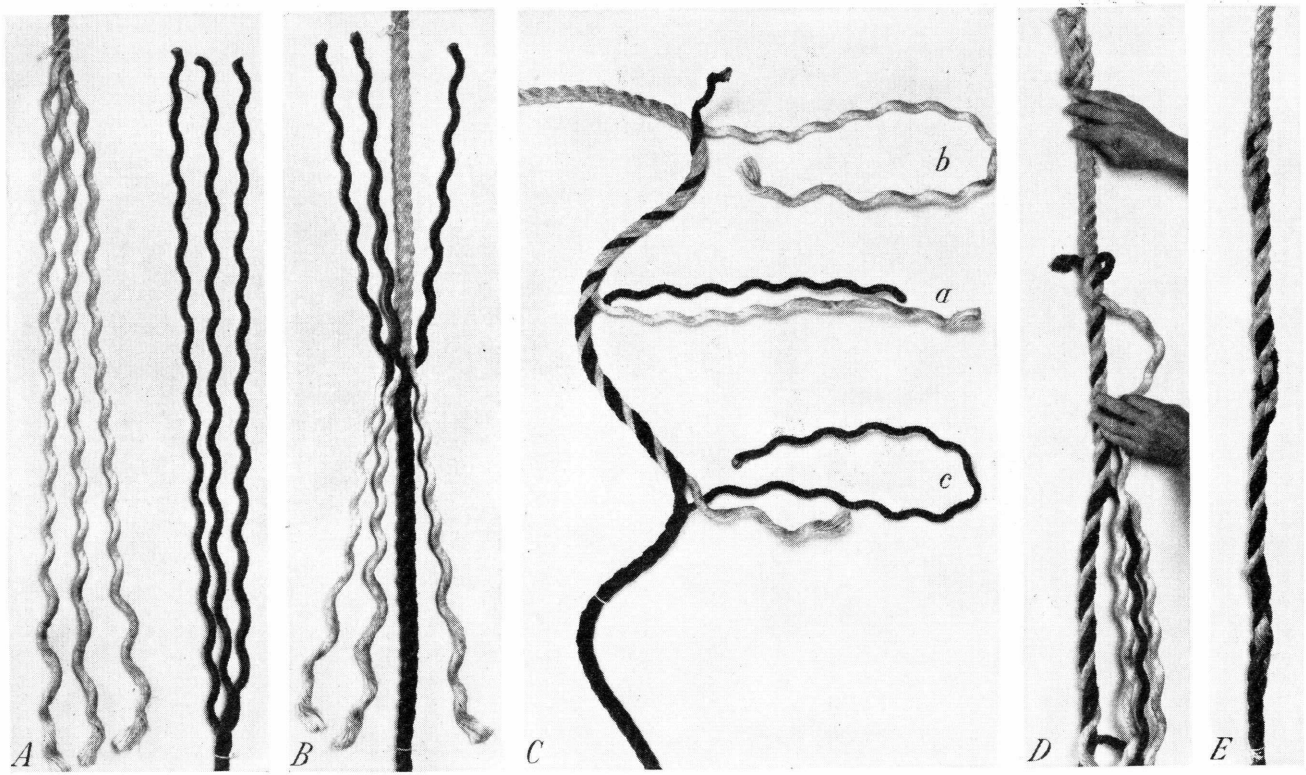

FIGURE 2.—Making a long splice: *A*, Strands unlayed; *B*, ends brought together; *C*, method of weaving—*a*, *b*, *c*, first, second, and third pairs of strands; *D*, tucking the ends; *E*, the completed splice.

the strands at right angles to each other. The strand from the left is then passed over the one from the right and under the next strand, as shown in figure 2,*D*. Each strand is then given two more tucks to complete the tie. When all strands have been tucked, the ties can be rolled under the foot on the floor to make the splice smooth. The completed splice is shown in figure 2, *E*.

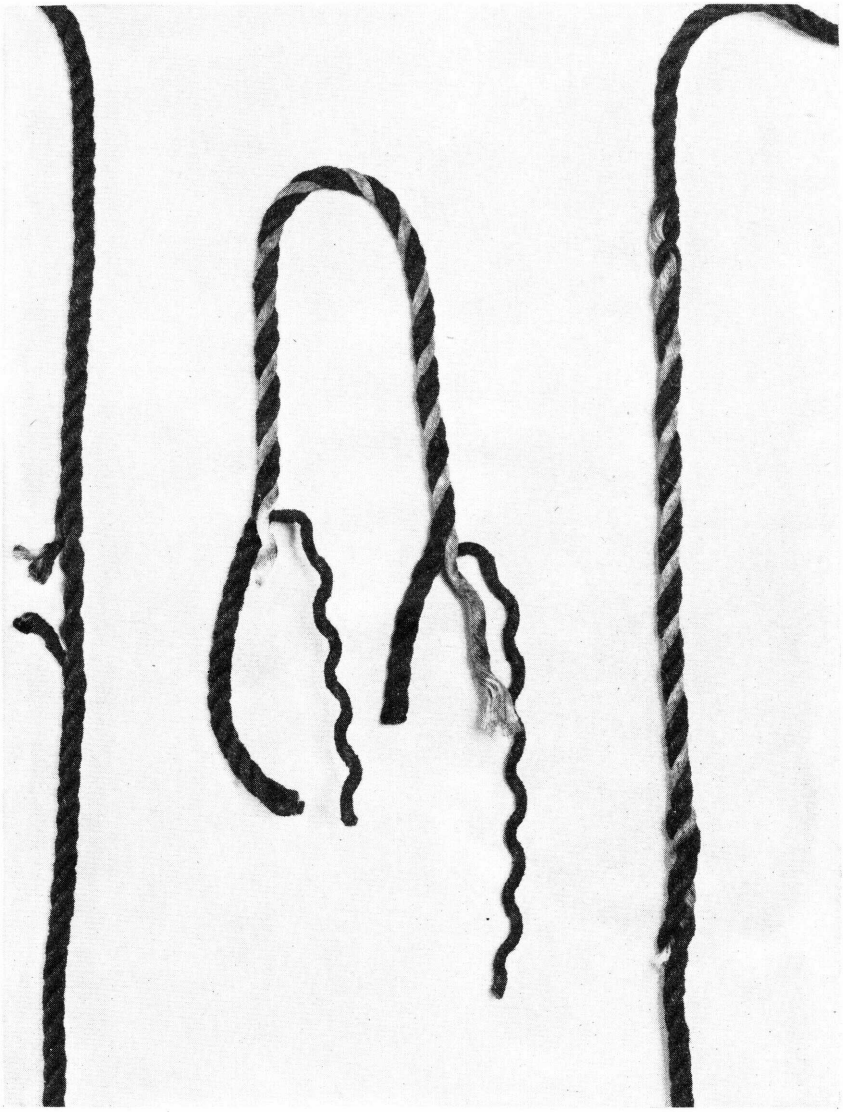

FIGURE 3.—Repairing a broken strand in a rope.

REPAIRING A BROKEN STRAND

When a rope has a single broken strand, it can be mended by unlaying each end of the broken strand six or eight turns and replacing it with a good strand from the same size of rope, as shown in figure 3.

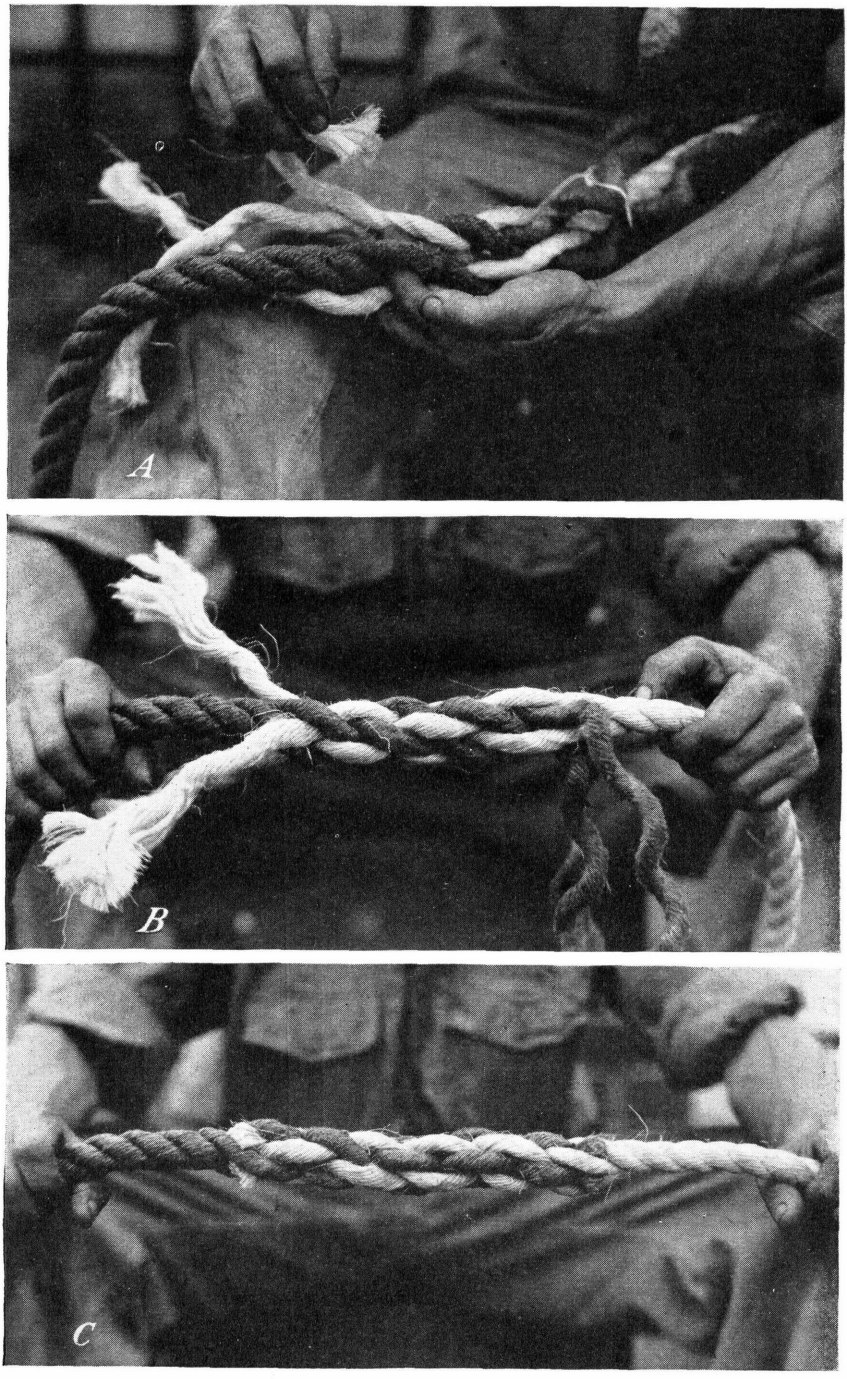

FIGURE 4.—Making a short splice; *A*, Tying the strands; *B*, tucking the strands; *C*, the finished splice.

The ends of the new and old strands are fastened by tucking the same as the ends of the strands in the long splice.

THE SHORT SPLICE

Where two pieces of rope are to be joined and there is no objection to having the splice larger than the rope, the short splice, which does not take up so much rope, can be used. In making a short splice, the ends of the rope are unlayed about six turns, and the two ends are brought together in the same way as in the long splice. Tie the strands from the right to the rope at the left, as shown in figure 4,*A*. One of the strands from the left is then passed over the nearest one from the right and under the next. Rotate the rope and follow the same procedure with the other strands. The strands from the right are now tucked once in the same manner. Figure 4,*B* shows one tuck in each strand. Two more tucks are given to each strand to complete the splice. If desired, half of each strand can now be cut out and the remaining half be given two more tucks to give the splice a taper. The finished splice is rolled under foot on the floor to make it smooth (fig. 4,*C*).

THE EYE SPLICE

The eye splice is used to make a permanent loop in the end of a rope or to attach it permanently to a ring and, once started, is made exactly the same as one end of a short splice. The end of the rope is unlayed five or six turns, the desired loop formed, and the first strand tucked, as shown in figure 5,*A*. The second strand is now tucked in, passing over the strand that the first went under and the third over the strand that the second went under and under the next. Each strand is now tucked from two to four times more, (fig. 5,*B*,) as in the short splice. The completed eye splice is shown in figure 5,*C*.

THE SPLICED CROWN

The end of a rope may be finished with a spliced crown if an enlarged end is not objectionable. This is simply a crown knot with the ends tucked into the rope and is formed in this manner: Unlay five or six turns of the rope. One strand is folded back along the rope, forming a loop, as shown in figure 6,*A*. The second strand is folded across the first and the third strand is folded across the second and passed through the loop, and all ends are pulled tight (fig. 6,*B*.) The ends are then tucked over the nearest strand and under the next,and the knot is completed like the short splice. The completed end is pictured in figure 6,*C*.

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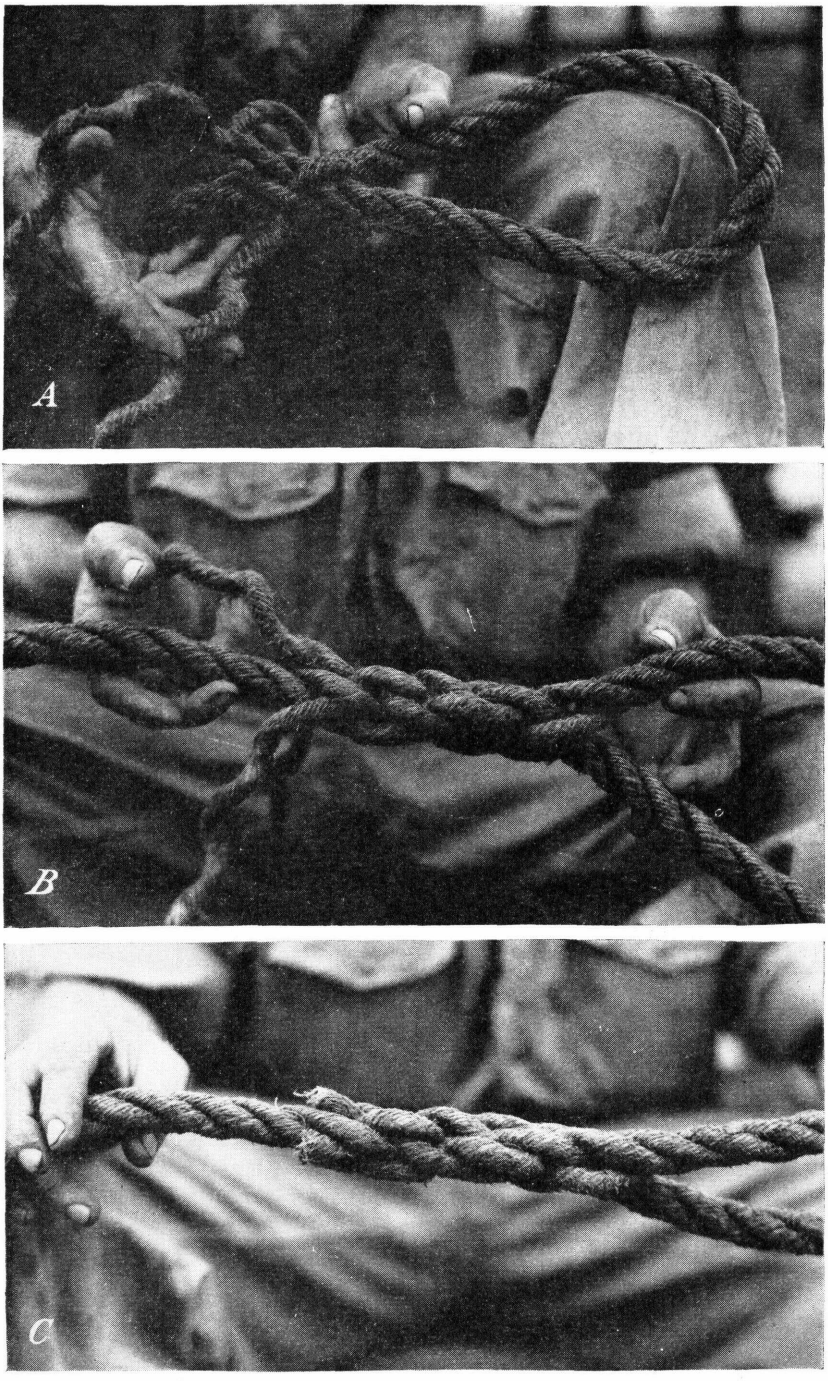

FIGURE 5.—Making the eye splice: *A*, Tucking the first strand; *B*, additional strands tucked; *C*, the completed splice.

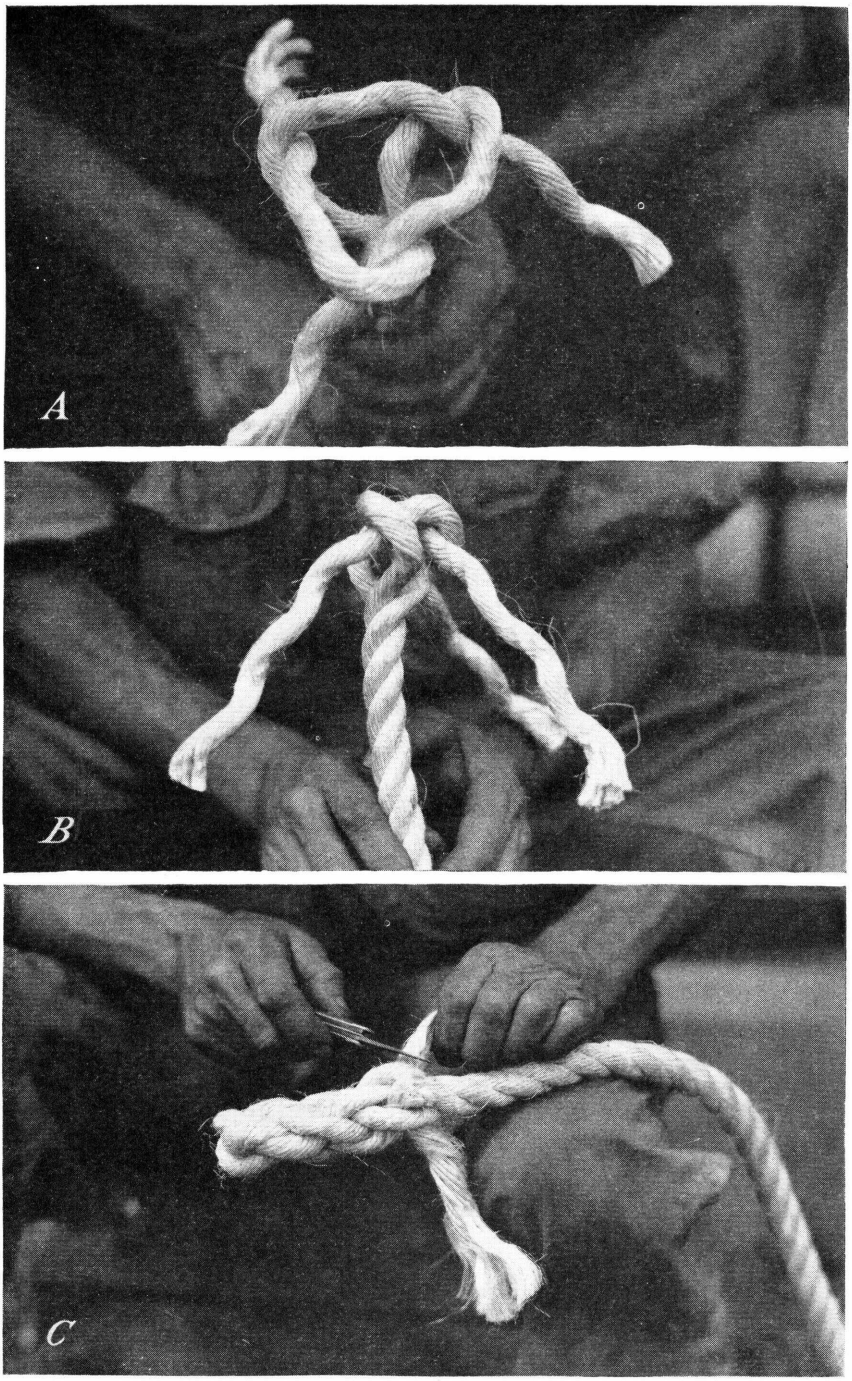

FIGURE 6.—Making the spliced crown: *A*, Forming the loop; *B*, securing the ends; *C*, cutting the loose ends.

KNOTS

THE SQUARE KNOT

The square knot is used to tie two ropes or cords together or to secure the end of cords used to tie packages. It is tied as follows: Place the two ends together with the right-hand rope crossing the left-hand rope and passing under it as shown in figure 7,*A*, then place

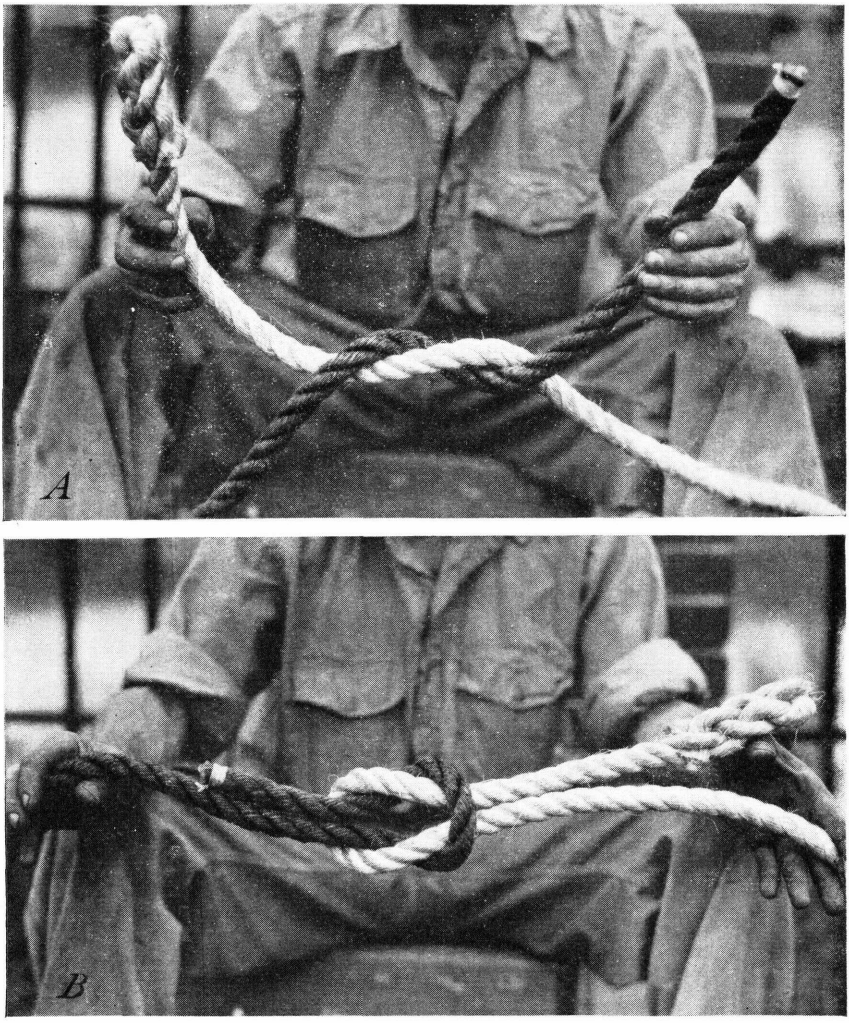

FIGURE 7.—Making the square knot: *A*, Manner of crossing the ends; *B*, the completed knot.

the rope now in the left hand across the rope in the right and pass it under. Now pull on the ends to complete the knot (fig. 7,*B*). If this knot is to be placed under a heavy strain which would make it difficult to untie, a marlin spike or pin can be placed through the center before the knot is pulled tight. When the pin is removed the knot can be easily untied.

THE SHEET BEND OR WEAVER'S KNOT

The sheet bend or weaver's knot is used to tie two cords, ropes, tapes, or thongs together, especially when one is larger then the other. It is tied as follows: Cross the right-hand rope under the left, as shown in figure 8,*A*. Take the standing part of rope and form a bight as shown in figure 8,*B*. One end is now looped around the standing part of rope and passed through the bight, as shown in figure 8,*C*. The knot is now pulled tight and looks like figure 8,*D*.

THE BOWLINE

The bowline knot in the end of a rope provides a loop that will not slip up and become tight and is easy to untie. It may be tied as follows: Place the rope through a ring or around any object desired, lay both hands on the rope palm down (fig. 9,*A*), form a loop in the rope by rotating the right hand (fig. 9,*B*), and with the left hand push a bight through the loop (fig. 9,*C*). The end of the rope is now passed through the bight and doubled back on itself (fig. 9,*D*), and held with the right hand. The knot is completed by pulling on the standing part of the rope with the left hand, as shown in figure 9,*E*.

HITCHES

THE HALF HITCH

The half hitch is used as a temporary fastening for ropes under a strain or to finish other knots or hitches. It is formed by passing the rope around an object, bending the end around the standing part, and pulling it back under itself. This pinches the end against the object to which it is tied as shown in figure 10.

THE TIMBER HITCH

The timber hitch is used for dragging or hoisting timbers. It is made in the same manner as the half hitch except that the end of the rope is given one or two complete turns around itself as shown in figure 11.

THE ANCHOR OR FISHERMAN'S BEND

The anchor or fisherman's bend is used to fasten a rope to a ring. It gives a larger wearing surface than a plain loop. It is shown in figure 12 and is made by passing two turns around the ring and securing the rope with one half hitch made around the standing part and through the two turns and passing the end to the standing part or giving one additional half hitch around the standing part alone. The end is then bound to the rope with twine.

THE PIPE HITCH

The pipe hitch is used to lift pipe or smooth poles vertically. It can be made by giving the rope three or four turns around the object, figure 13, *A*, and securing the end with two half hitches, figure 13, *B*. Another arrangement, as shown in figure 13, *C*, makes it possible to keep the pipe in a vertical position while being moved.

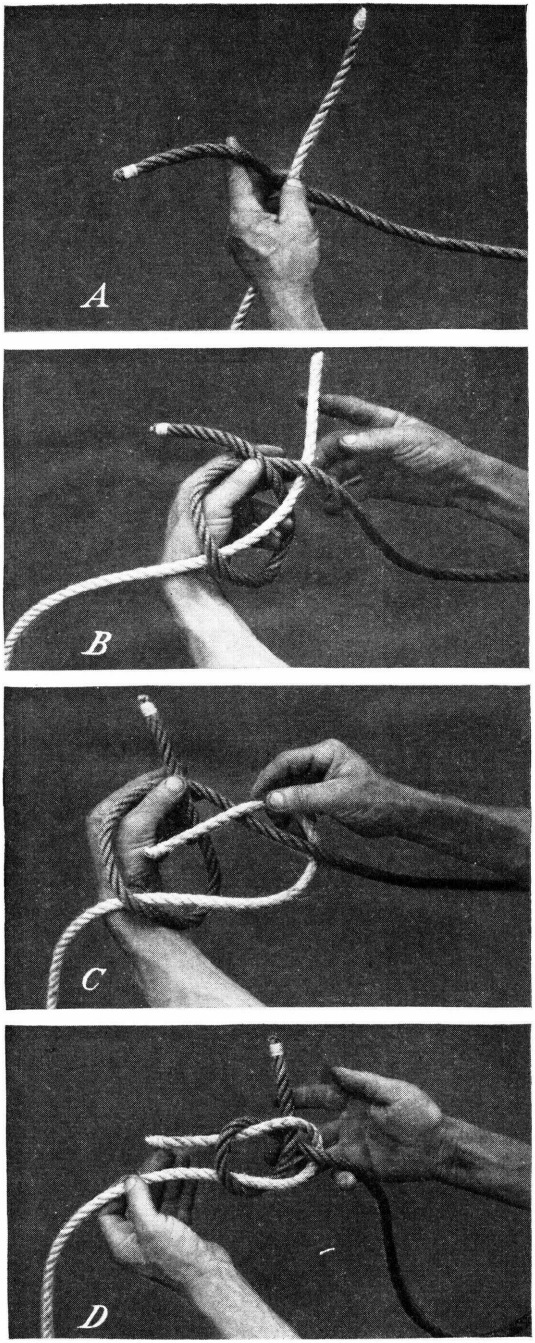

FIGURE 8.—Making the sheet bend or weaver's knot: *A*, Crossing the ends; *B*, forming a bight; *C*, passing end of rope through bight; *D*, appearance of knot before being tightened.

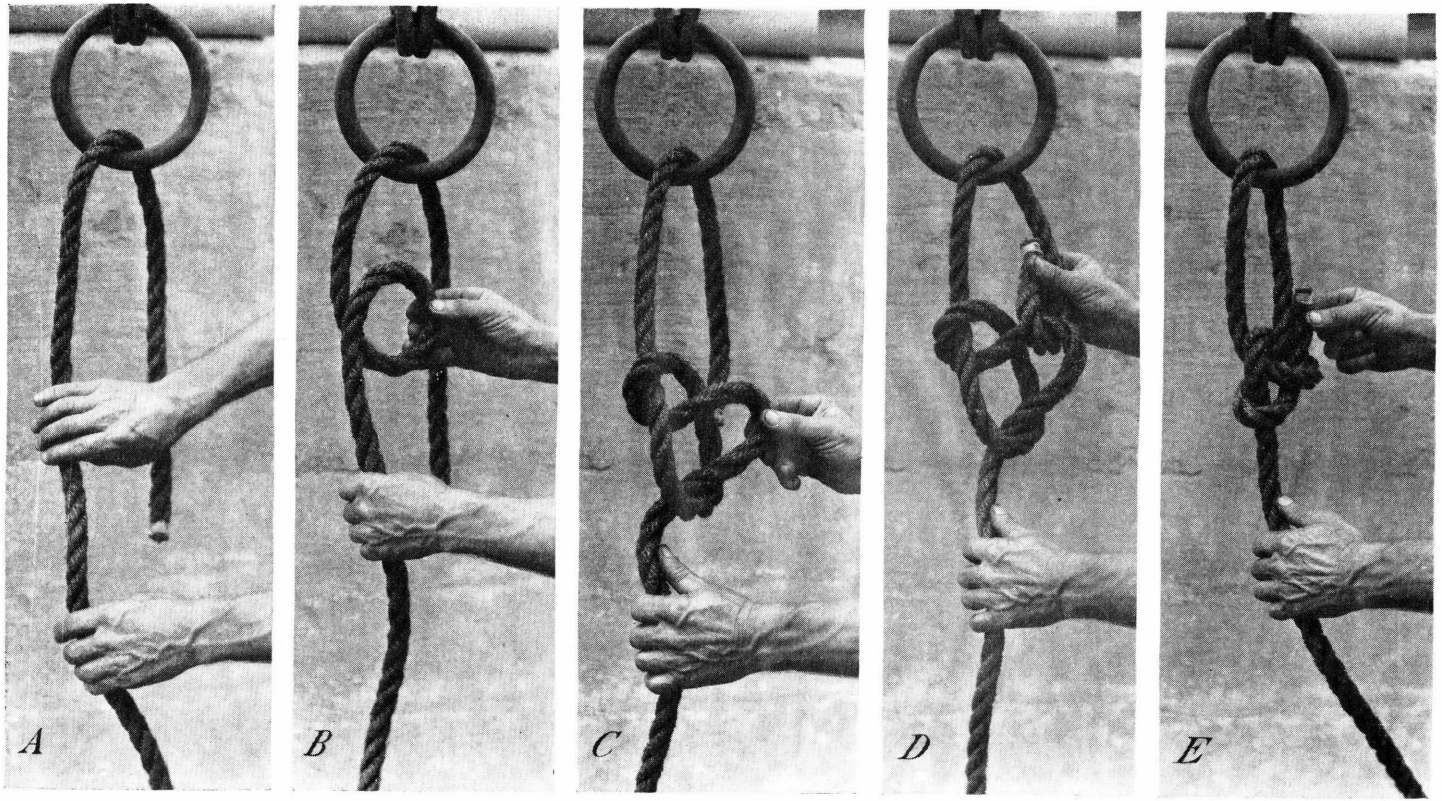

FIGURE 9.—A bowline—Texas method: *A*, Position of rope at start; *B*, forming the loop; *C*, threading bight through the loop; *D*, end of rope doubled back *E*, completing the knot.

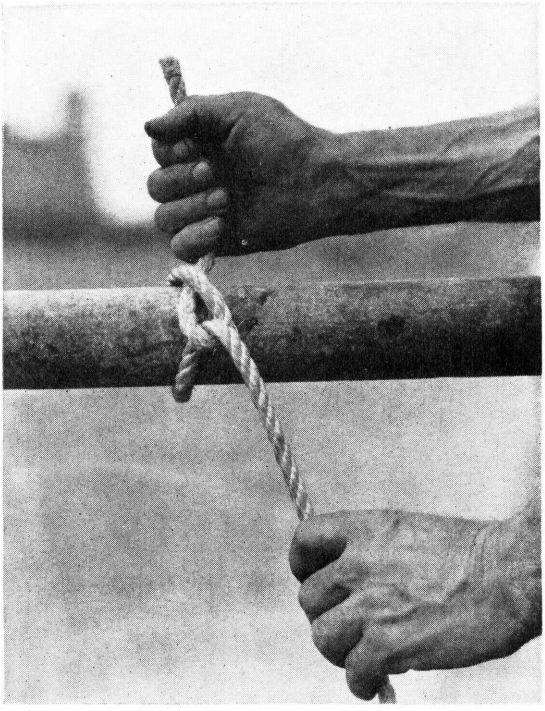

FIGURE 10.—The half hitch.

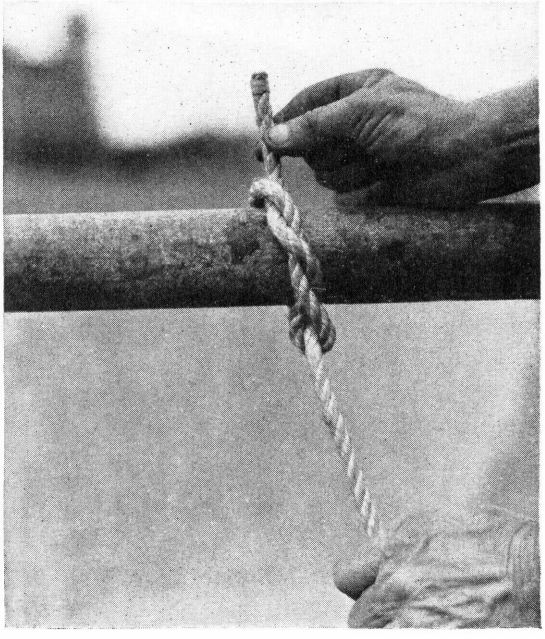

FIGURE 11.—The timber hitch.

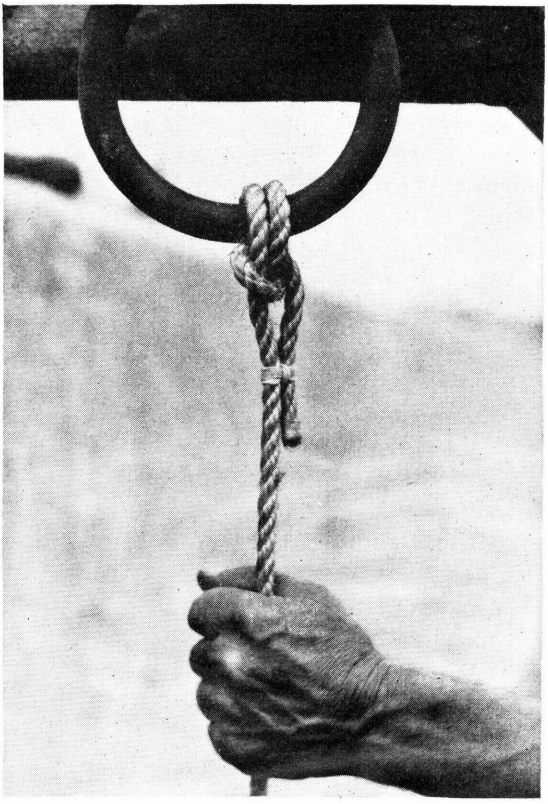

FIGURE 12.—Anchor or fisherman's bend.

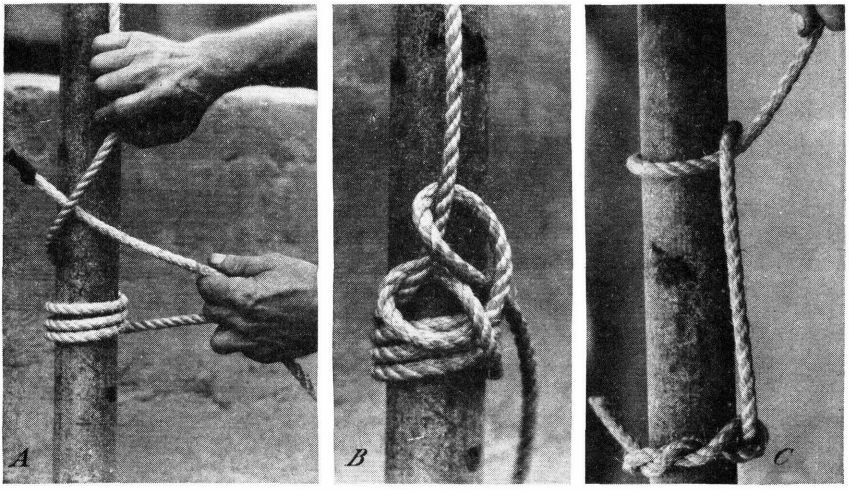

FIGURE 13.—The pipe hitch: *A*, Passing the rope around the pipe; *B*, end secured with two half hitches; *C*, another form of pipe hitch.

THE BLACKWALL HITCH

The blackwall hitch is used to attach a rope to a hook for pulling loads. It is formed by holding the rope back of the hook, passing the end over the hook and the standing part over the end part, as shown in figure 14.

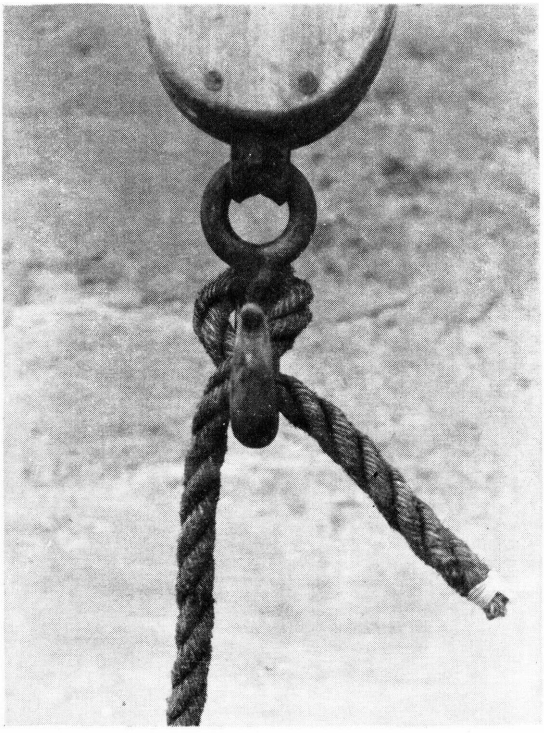

FIGURE 14.—The Blackwall hitch.

BLOCKS AND TACKLE

A pulley or set of pulleys mounted on a pin encased in a shell or frame having a hook or ring fixed at one end to fasten it to a fixed or movable object is called a block. Some blocks have a ring or eye called a becket fixed to the block on the end opposite the hook. The becket is used to attach one end of a rope to a pulley when making up a tackle, block and falls, or set of falls. These names all refer to blocks that have been reeved or threaded with a rope.

When tackle is ready for use the block at the top is a double block with a hook and is called the fall block. The rope leaving it, to which the pull is applied, is called the fall rope. The block at the lower end is a single block with a becket and in this case is called the movable block. The mechanical advantage gained by use of tackle is measured by the number of ropes that are shortened by pulling on the fall rope. The fall rope itself is not counted unless it leaves the bottom block and the lift is directly up in line with the load lifted. Where

the fall rope leaves the fixed block the mechanical advantage is the number of ropes between the blocks less one.

The life of a rope used over pulleys or in blocks is affected by the diameter of the pulley or the size of block and the strain on the rope. A good rule to follow is to use a block with a body eight times the diameter of a rope less than 1 inch in diameter. Table 1 lists suitable sizes of blocks to use with different diameters of rope, and their recommended working loads. The figures on safe working stress in this table are averages for manila rope and include a factor of safety of 5. The ultimate breaking strength is approximately five times as great as the figures given and varies with the brand and class of rope. When exact strengths are desired use the manufacturer's figures. Sisal rope is only 75 percent as strong as manila rope.

Ropes running over pulleys continuously for any length of time will give better service if lubricated. Ropes used on rope drives or in other conditions of severe pulley service are generally lubricated commercially, but the application of graphite is easily accomplished and is an effective method of lubrication.

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